

Present Pavement Width: 24' HMA
Present Shoulder Type/Width: 4' Paved - 6' granular Outside; 4' paved - 2' granular wedge Median.
Roadway Top Width: 40' each direction with 74' between centerlines.

Pavement History:

MP 4.37 to 7.44 Desc: EB from US75/IA 12 Interchange to Little Whiskey Creek

Original Pavement: 10" PCC

Year Constructed: 1964

PCC Coarse Aggregate Source: Hawarden - Gravel 2

Years Resurfaced: 2003 5.5" HMA

Years Reconstructed: N/A

MP Work Listing: 2003 included 10" x 4' HMA shoulders

MP 4.37 to 7.44 Desc: WB from US75/IA12 Interchange to Little Whiskey Creek

Original Pavement: 9.5" PCC

Year Constructed: 1954

PCC Coarse Aggregate Source: Hawarden North - Gravel 2

Years Resurfaced: 2003 HMA 6.5"

Years Reconstructed: N/A

MP Work Listing: 2003 included 10" x 4' HMA shoulders

BACKGROUND

During the concept preparation for project number NHSN-020-1(175)—2R-97 it was determined that due to the close proximity of the lower speed vertical curves near side road intersections, steep grades resulting in the slowing of truck, and higher traffic volumes (especially truck traffic) that the portion of the project west of the Little Whiskey Creek Bridges (approximate MP 7.44, approximate Sta. 555) should be pursued as an inlay/reconstruction project, resulting in the project portrayed in this concept statement. After the concept is approved it will be determined who will complete the project development, the Office of Design or consultant.

Several of the vertical curves have public road intersections near the crest of the vertical curve which results in decreased sight distance at the intersections, which in turn has resulted in the speed limit being kept at 55 mph for this rural expressway section. Additionally, there are several steep grades that cause substantial slow down for loaded trucks. See the table below of the grades and vertical curve information. (The truck speed reduction is based on Design Manual Section 2B.1.)

| Point of Vert. Curvature Sta. | Vert. Curve Stopping Sight Distance/Des Speed | Entering Grade | Leaving Grade | Length of Entering Gradient | Approx. Truck Speed Reduction |
|-------------------------------|---|----------------|---------------|-----------------------------|-------------------------------|
| 454+75 EB | 467' / 50 mph | 4.68 | -2.50 | 1765' | 14 mph |
| 473+50 EB | 645' / 65 mph | -2.50 | 2.92 | 1875' | N/A |
| 486+25 EB | 445' / 50 mph | 2.92 | -2.31 | 1275' | 8 mph |
| 495+25 EB | 454' / 50 mph | -2.31 | 2.00 | 900 | N/A |
| 512+25 EB | 475' / 50 mph | 2.00 | -4.68 | 1700 | 7 mph |
| 530+50 EB | 527' / 55 mph | -4.68 | -1.05 | 1825 | N/A |
| 541+75 EB | 481' / 50 mph | -1.05 | -4.75 | 1125 | N/A |
| 548+75 EB | 458' / 50 mph | -4.75 | 0.00 | 700 | N/A |
| | | | | | |
| 549+75 WB | 391' / 45 mph | 0.00 | 4.60 | 825' | N/A |
| 541+50 WB | 515' / 55 mph | 4.60 | 1.11 | 825' | 8 mph |
| 529+75 WB | 545' / 55 mph | 1.11 | 5.00 | 1175' | N/A |
| 512+50 WB | 495' / 55 mph | 5.00 | -2.02 | 1725' | 18 mph |
| 495+25 WB | 417' / 45 mph | -2.02 | 2.24 | 1725' | N/A |
| 486+00 WB | 503' / 55 mph | 2.24 | -2.97 | 925' | 4 mph |
| 473+50 WB | 402' / 45 mph | -2.97 | 2.58 | 1250' | N/A |
| 455+00 WB | 484' / 50 mph | 2.58 | -4.73 | 1850' | 9 mph |
| | | | | | |

EXISTING CONDITIONS AND CAUSES OF DISTRESS:

The 2003 HMA surface is oxidized with minor loss of fines in some areas. The joints and cracks have been filled and the centerline has been strip sealed by local maintenance forces. There is moderate to severe spalling of the longitudinal joints and cracks which has led to significant spall patching along the longitudinal joints. There are several drainage culverts that have separated joints and/or corrosion which has led to loss of soil in the shoulder and foreslopes. There are many trees in the 30' minimum Clear Zone and in the drainage ways within ROW.

Several cores were taken at or near the centerline joint at locations where there was existing spalling and/or oil and chip repairs completed by local maintenance forces. The cores indicate that the PCC and the lower layer of HMA at the joints is deteriorating and causing the joint concerns. The width of deterioration appears to be approximately 12" to 18" centered on the joint.

Safety Considerations:

The EB outside and median foreslopes were constructed as 3:1; with the foreslopes on the EB

outside near the culverts with letdowns (Type 2) and at deep fills being constructed as 2.5:1; the WB outside foreslopes were constructed as 3:1 or 2:1 on fills over 6'. The transverse slopes on the median crossovers, entrances, and dikes were flattened with 2003 HMA project. With the separate profiles there are areas that the grade separation between the EB and WB lanes is substantial and adds to the safety concern of steep slopes in the median.

There are no horizontal curves greater than 3° within the project limits. The horizontal alignment will be UAC.

Turn Lanes are not currently provided at Grandy Hills Drive and Buchanan Ave E intersections. These two intersections should be reviewed further for EB right turn lanes and the left turn lanes should be constructed.

There are no bridges located within the project limits as the project begins at the east end of the US 75/IA 12 Interchange bridges and the end of project is just west of the Little Whiskey Creek bridges.

There are three large culverts within the limits of this project and one is protected by guardrail. The two large culverts at Sta. 495+49 and 535+67 have the headwalls and openings outside of the clear zone. W-Beam Guard Rail at 549+83 WB and Cable Guard Rail for EB at 549+83. At Sta. 549+83 there is a 12' x 10' RCB which is generally in good condition except the guard rail attachments through the roof of the structure at the left end have spalled concrete and the bolts have corroded with very little section remaining. There are also minor horizontal cracks through the curved section near the right end of the structure. Any possible replacement, extension, or repair work on these structures will be determined during further project development.

There is 368 feet of cable guardrail protecting the right foreslope at Sta. 546+45. The cable guard rail will be reviewed for necessary upgrade or slope flattening.

There is an existing overhead DMS sign located over the WB lanes near Sta. 523 which has paved shoulders and cable guard rail protection for the foundations on the WB median and outside shoulders and the EB median shoulder. This overhead DMS should be UAC if possible. If UAC cannot occur then salvage and reuse of the truss and DMS board should be considered.

There are no small culverts marked with object markers. The following culverts will need some repairs if not being replaced by this project:

| Station | Size & Type | Location | Comments |
|---------|---------------------------|-------------|------------------------------------|
| 473+00 | 24" RCP | Median | Separated joints |
| 473+58 | 24" RCP | Rt | Buried outlet & Separated joints |
| 475+00 | 24" RCP w/ CMP Letdown | Median | Separated joints |
| 495+00 | 24" RCP w/ CMP Letdown | Median & Rt | Separated joints & Corroded outlet |

| | | | |
|--------|-------------|-------------|---|
| 526+78 | 4' x 4' RCB | Rt | Silted Ditch at Inlet – consider drop inlet |
| 540+00 | 24" RCP | Median | Separated joints |
| 552+60 | 24" RCP | Median & Rt | Separated joints |
| 553+24 | 24" RCP | Rt | Separated joints |
| | | | |

The five-year crash study period from January 1, 2013 to December 31, 2017 included 57 total crashes within the project limits. Of the 57 crashes there were 1 fatal, 2 involving major injury, 4 involving minor injury, and 5 involving a possible or unknown injury. There were 26 animal related crashes, 3 ran or FTY from Stop Sign or Yield Sign, 7 ran off the road (Rt or Lt) or crossed the median, 4 were swerving or evasive action, 4 were driving too fast for conditions or exceeded the authorized speed, and 4 were following too close. 7 of the crashes occurred on wet, snow, slush, or ice/frost covered roads. The crash rate for this project is 125 crashes per hundred million vehicle miles traveled (HMVMT) which is higher than the most recent statewide average for Rural Expressways of 41 crashes per HMVMT. The crashes are distributed throughout the corridor with a slight concentration of crashes near the interchange ramps and near the crest vertical curves.

Feasible Alternatives:

The original project number NHSN-020-1(175)—2R-97 included a review and recommendation by the Pavement Design Section which recommended 0.2" additional HMA on the WB lanes, and no additional structure is needed on the EB lanes. A pavement determination for full depth pavement will be obtained during further project development for this shortened segment.

Several alternatives were considered such as thin lift HMA mill and resurface, full depth HMA milling and resurfacing, milling the existing HMA to leave a 1.5" bond breaker and place PCC overlay, or do a PCC Inlay with some correction of the profile and cross section to meet current design standards.

PCC Inlay 10" x 36' width - \$10,403,900 (See attached iPDWeb cost estimate for details)

Recommendations:

For the reasons stated in the background section of this report, it was determined that the only viable alternative for this segment is the pavement inlay with correction of the profile and cross section. Survey will be required to establish the corrected profile and ROW needs.

The NB US 20/US 75 to EB US 20 high speed ramp will also be replaced with a ramp configuration that is moves the ramp intersection with EB US 20 further to the west (closer to the center of the interchange). This will provide better visibility and reduce ramp speeds to more closely match the expected/desired future US20 speed in this area. This revision will likely require an Interchange Operations Report to be completed once a proposed ramp alignment is determined. No additional ROW is expected for this ramp re-alignment. The estimated cost for this revision to the concept is \$597,300.

The estimate is based on a proposed cross section which consists of 24' paved roadway with 6' paved and 4' granular shoulders on the outside and 6' paved shoulders median in each direction. The foreslopes should be 6:1 within the clear zone, and 3.5:1 outside the clear zone. The median will have 6:1 foreslopes and be 50' between the edge of travelled lanes. The practical design approach will be used during further project development to determine the appropriate cross section configuration.

Traffic will be maintained on mainline throughout the project with at least one lane open each direction during construction. Traffic would be head to head in the lanes opposite the direction being constructed by utilizing the existing median crossover just west of Charles Avenue and temporary pavement to construct a temporary crossover west of the US 75/IA 12 interchange. This project was reviewed and was determined that it does not meet the criteria for being a traffic critical project. However, the head to head traffic will be carried through the interchange area and the ramps will need to remain open as much as possible so staging considerations will be needed for the ramp areas. Additionally, Glen Ellen Road does not have another outlet, so construction will need to be staged through this intersection.

Permanent ROW is expected to be required for this project.

There are no sidewalks or trails in the project limits.

There is no railroad involvement with this project.

Funds Programmed:

This project is currently not listed in the five-year program but is being developed for a proposed letting date of 12/19/2023, at an estimated cost of \$11,001,200.

Project Agreements:

Woodbury County typically asks to have the side roads paved to the end of the returns so an agreement will likely be needed on this project for this paving as well as for temporary closure of county side roads.

Project Schedule: Based on 12/19/2023 letting.

| | |
|--------------------|------------|
| D0(Concept) - | 6/01/2018 |
| D1(Survey) - | 12/01/2018 |
| D2(Field Exam) - | 6/28/2019 |
| D5(Plans to ROW) - | 4/2/2021 |
| P9(PIM) - | 10/2/2021 |
| D8(Final Plans) - | 10/3/2023 |
| L3(Letting) - | 12/19/2023 |

Cc:

| | | |
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